

NATIONAL SCIENCE FOUNDATION

WASHINGTON, D.C. 20550

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August 19, 1974

Deputy Minister E. R. Shenderoy
Ministry of Microbiological Industry
U.S.S.R. Council of Ministers
Lesteva 18
Moscow, U.S.S.R.

Dear Dr. Shenderoy:

It is a pleasure to speak with you again if only through the medium of a letter. I am enclosing copies of the photographs I took of you and your Working Group, and would appreciate your giving them to the men concerned. I regret that Dr. Berezin was not available at the time I took the photographs.

Last week, just before I left town, I was informed that Dr. Humphrey had received a telegram from Dr. Berezin informing him that a conference was to be held on "Immobilized Enzymes" and asking him to notify both Dr. Tsao and me, and stating that he was sending information to the American participants. The date of the seminar was given as October 21-26, 1974, to be held at Moscow University.

The impression given by the telegram in referring to a Soviet-American seminar, and in Dr. Berezin's letter sent to various Americans, was that this seminar (October 21-25) was part of our Project IV on enzymes. In view of the procedures being followed, however, I assume that although the seminar may be related in subject matter to our Working Group activity, it is not actually part of it. If it were under our official cooperative program, mutual agreement on both the proposed dates and the agenda would have been required in advance; under this official procedure, invitations would not have been issued to individuals on the U.S. side since the selection of U.S. participants is a matter solely for determination by the U.S. side, although your suggestions on this matter would have been appreciated and given appropriate consideration.

Finally, October 21-25 is an unfortunate choice of dates. The Soviet side has recently accepted the dates of October 24-25 for the third meeting of the US/USSR Joint Commission on Scientific and Technical Cooperation to be held in Washington, D. C.

Microbiology

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Moreover, if we were considering an official meeting, both sides would have had to determine the applicability of the principle of receiving side pays.

If Dr. Berezin merely wishes to invite various Americans to attend an academic meeting under private auspices, that is, one not under the Science and Technology Agreement, then of course it will be up to the invitees to determine whether or not they can attend. It should be understood, however, that should they accept the invitation, their attendance would not be as representatives of the Working Group, nor would the meeting be considered as part of the Working Group's activities.

It is understood, of course, that in a number of instances, there may be meetings that are established for purposes independent of the Joint Working Group. Such meetings could be set up separately as was the Spore Conference to be held in Michigan, and to which we invited some of your people to attend (but were told that it was not possible for them to do so), or some meetings that are held as part of larger scientific society meetings. In such cases, we recognize that neither the dates nor the agenda of the meetings can be changed. Even though these meetings are not set up as official working group meetings, they can serve a similar purpose if the subject matter is such that it fits into our program. In such instances, official representatives of both sides of the Working Group could attend the meeting and then meet afterwards, if it seems appropriate, to discuss their reactions and to discuss the implications of what they have learned as it might affect the detailed aspects of the research program agreed upon by the Working Group. Of course, such attendance would have been the subject of a prior detailed discussion and mutual agreement by both sides of the Working Group.

I regret that all these details must be brought up, but I hope you do recognize their importance to our conducting an orderly series of seminars and meetings directly related to our agreed-upon research projects. I will be meeting with the various members of the U.S. Working Group to determine what our (U.S.) specific plans will be for seminars or conferences in light of the agreement we reached in June. Later, perhaps, the U.S. and the U.S.S.R. representatives could discuss the establishment of such seminars or conferences, Project by Project, so that various administrative difficulties could be avoided and we could spend more of our time being concerned with scientific matters.

Please extend to Dr. Berezin my sincere good wishes and let him know that I am sure that his seminar, whenever it is held, will be a most outstanding one. This comment is not only made by me personally, but comes from a number of our people who are familiar with Dr. Berezin's outstanding work.

Sincerely yours,



J.M. Leise

Chairman

U.S. Side of the Joint US/USSR
Working Group on the Production
of Substances by Microbiological

Means

Enclosure



American Chemical Society *info*

PUBLIC AFFAIRS AND
COMMUNICATION DIVISION

1155 SIXTEENTH STREET, N.W.
WASHINGTON, D.C. 20036
Phone (202) 872-4600

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August 15, 1974

Professor G. K. Boreskov
Director
Institute of Catalysis
Novosibirsk 630090
U.S.S.R.

Dear Professor Boreskov:

As you will see by the enclosed copy of my letter to Dr. Korneyev, I should like to visit the Soviet Union in the interest of working toward optimum effectiveness of our administrative procedures in the Chemical Catalysis Program. As it is my understanding that my responsibilities in this program relate most directly to those of Dr. Korneyev, it is certain that I shall have active contact with you and your colleagues in Novosibirsk. I believe that some personal acquaintance and discussion would be of value in the interest of the effectiveness of my service to the program. Therefore, I am suggesting that if you find it convenient I should like to visit you some time in the period September 28 to October 1.

I send my respects and cordial good wishes and hope that I may hear favorably from you in this matter.

Sincerely yours,

Richard L. Kenyon
Program Administrator

RLK:bm
CC: Dr. S. G. Korneyev
Dr. J. Tech
BCC: Dr. R. Wald

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to you that I visit Moscow and Novosibirsk during the period September 25 to October 2, I should be pleased to make the trip. It would be done on a sending-side pays basis.

I send best wishes for the success of our cooperation and look forward to hearing from you that we may meet soon.

Sincerely yours,



Richard L. Kenyon
Program Administrator

RLK:bm

CC: Professor G. K. Boreskov
Professor J. D. Baldeschwieler
Dr. J. Tech

BCC: Dr. R. Wald ✓

American Chemical Society

PUBLIC AFFAIRS AND
COMMUNICATION DIVISION

1155 SIXTEENTH STREET, N.W.
WASHINGTON, D.C. 20036
Phone (202) 872-4600

August 16, 1974

Dr. Stepan G. Korneyev
Chief, Foreign Relations Department
Presidium, U.S.S.R. Academy of Sciences
14 Leninskiy Prospect
Moscow V-71, U.S.S.R.

Dear Dr. Korneyev:

I have learned from the reports of the recent conference of principal investigators of the Chemical Catalysis Program of the U.S.-U.S.S.R. Agreement on Cooperation in Science and Technology of further establishment of administrative procedures. As we are now moving toward fuller development of the program, I believe some direct contact and discussion among the program administrators would be useful. It would aid understanding and cooperation in planning and in bringing to fruition the plans for the next step in implementation of this cooperative work.

I should like to visit you at our earliest mutual convenience to discuss with you and your colleagues our procedures and plans. My responsibilities include those of general administration of the catalysis program. This is executed in consultation with Dr. Baldeschwieler, as working group chairman and the project coordinators with the financial support of the National Science Foundation and in coordination with the U.S. Secretariat.

I should like to visit you in Moscow, arriving on September 25 for two or three days, during which time we could hold informal discussions. After that I would like to proceed to Novosibirsk for two days to discuss plans with Professor Boreskov and his colleagues in order to gain an understanding of the needs as they view them.

If you would be so kind as to let me know through Dr. Jack Tech of the U.S. Embassy in Moscow that it would be acceptable

Record of Third Meeting
of the US/USSR Joint Working Group
for Scientific and Technical Cooperation on
The Production of Substances by Microbiological Means

Washington, D.C., June 10-12, 1974

In accordance with the agreement between the government of the U.S.S.R. and the government of the U.S.A. on cooperation in the Field of Science and Technology and the recommendations of the second meeting of the Joint U.S.-Soviet Commission, the Third U.S./U.S.S.R. Joint Working Group for Scientific and Technical Cooperation on the Production of Substances by Microbiological Means has met to examine and to agree on specific questions of bilateral cooperation in the above mentioned field.

A list of members of the two delegations who participated in the meeting is attached (Appendix 1). The agenda adopted by the Joint Working Group is also attached (Appendix 2). The Soviet and the U.S. sides have examined the proposed plans for cooperation and found them to be basically in agreement.

The plan contains agreed amendments introduced by both sides. The Joint U.S.-Soviet Working Group has approved the final version of the agreed plans for the work programs and recommends their practical implementation (Appendix 3).

The Joint Working Group has agreed with regard to the exchange of information on the work being done, on the exchange of junior and senior scientists for the joint work, on the exchange of information, lectures, and also on joint conferences and on the exchange of periodic reports on scientific work (Appendix 4).

The Joint Working Group has further agreed that joint meetings of project coordinators be held to facilitate research work, to convene conferences, and to exchange information (Appendix 5).

The Parties returned to the discussion of the question of possible expansion of the fields of cooperation, in particular in the following problems:

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- decomposition of synthetics, pesticides, and chemical compounds by microorganisms. Prevention of spoilage by microorganisms;
- research in the field of production and testing of microorganisms for bacterial fertilizers;
- research on the use of microorganisms for the extraction of non-ferrous metals and other problems of geological microbiology.

The parties agree that they will conduct a study including mutual visits and exchange of information. As soon as possible, but no later than the end of 1975, both sides will submit their proposals.

The Joint Working Group has agreed that the exchange of specialists and mutual visits by project coordinators should be based on equality of numbers and duration of visits in the countries of the participants.

Both sides of the Working Group favor the adoption of receiving side pays arrangements for financial support of cooperative activities in accordance with the directives of the Joint U.S.-Soviet Commission.

The Joint Working Group also agreed on the principles for the use of joint results which will correspond to the guiding principles adopted by the U.S.-Soviet Joint Commission regarding the rights to intellectual property.

The Parties have decided that the research programs and meetings of project coordinators should commence without delay. It was also decided that the meetings of the Joint Working Group will be held in the future during the month of June in each country in turn. At those meetings, in addition to other work-related questions, reports of each project coordinator, the work results, and future plans of the various research projects will be reviewed. These reports, together with the conclusions and recommendations contained in them, will as a rule, be used as a basis for the Annual Report to the Joint Commission. A draft agenda for the Fourth Meeting is enclosed (Appendix 6).

U.S. DELEGATION

Dr. Martin Alexander
Department of Agronomy
Cornell University
Ithaca, New York 14850

Dr. Joshua M. Leise (Chairman)
Senior Staff Associate
Deputy Assistant Director for Research
National Science Foundation
Washington, D.C. 20550

Dr. William E. Brown
Director, Department of Microbiology
The Squibb Institute of Medical Research

Dr. Henry Bungay
Vice President for Research
and Development
The Worthington Chemical Company
Freehold, New Jersey 07728

Dr. George Tsao
Program Manager, ATA
National Science Foundation
Washington, D.C. 20550

Dr. Charles Cooney
Department of Nutrition & Food Science
MIT
Cambridge, Massachusetts 02139

Dr. Daniel I. C. Wang
Department of Nutrition and
Food Science
MIT
Cambridge, Massachusetts 02139

Dr. Edmund Field
Consultant
American Oil Company
5719 South Kenwood Avenue
Chicago, Illinois 60637

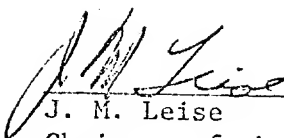
Dr. Harlyn O. Halvorson
Professor of Molecular Biology
Brandeis University
Waltham, Massachusetts 02154

Dr. Arthur N. Heimpel
Plant Protection Institute
Department of Agriculture
Bio-Science Bldg., Room 214
Beltsville, Maryland 20704

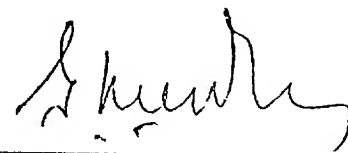
Dr. Arthur E. Humphrey (Co-chairman)
Dean, College of Engineering
and Applied Science
University of Pennsylvania
107 Towne Bldg.
Philadelphia, Pennsylvania 19174

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Done in Washington, on this 19th day of June 1974, in the English
and Russian languages, both texts being equally authentic.



J. M. Leise
Chairman of the U.S. side of the
Joint Working Group



E. Shenderoy
Chairman of the Soviet side of the
Joint Working Group

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MEETING OF THE US/USSR WORKING GROUP
ON THE PRODUCTION OF SUBSTANCES BY MICROBIOLOGICAL MEANS

Monday-Wednesday, June 10-12, 1974

1:30 P.M. Monday - 4:00 P.M. Wednesday

at

U.S. State Department
2201 C. Street, N. W.
Washington, D. C.
Room 1105

AGENDA

1. Discussion of U.S. and USSR research plans as submitted by each side.
2. Proposed changes (additions and deletions).
3. Determination of an agreed-upon version of submitted plans.
4. Exchange of information on:
 - a. Reports
 - b. Post-Doctoral Exchange
 - c. Senior Research Personnel Exchange
 - d. Conferences
 - e. Joint meeting of scientific coordinators
5. Final Agreement
6. Future meetings
7. Signing of Protocol

U.S.S.R. DELEGATION

- ✓ Yevgeniy R. Shenderoy (Chairman)
Deputy Chief, Main Administration
of Microbiological Industry of the
U.S.S.R. Council of Ministers
- ✓ Il'ya V. Berezin (Corresponding member of the AS USSR)
Dean of Chemical Faculty of
Moscow State University
Professor, Doctor of Chemistry
- ✓ Lev A. Mel'nikov (Senior Research Staff Member)
All-Union Research Institute of Protein
Synthesis
Candidate of Medical Sciences
- ✓ Vladimir I. Seregin
Deputy Chief of Technical Department
Main Administration of Microbiological
Industry of the U.S.S.R. Council of
Ministers
- ✓ Vitaliy V. Sukhodolets
Deputy Director of All-Union Research
Institute of Genetics
Candidate of Biological Sciences
- ✓ Shamil' G. Yekikeyev
Chairman of Chemical Cybernetics Department
Kazan Institute for Chemical Technology
Candidate of Technological Sciences

APPENDIX 3

Appendix 3 shows the preliminary estimated number of seminars, working sessions, dates and duration of each, and also the number of trainees on both sides and the duration of their stay and will be confirmed during the implementation of the programs.

WORKING PROGRAM

Project 1: "Development of Technology for Industrial Production and Utilization of Food and Food Proteins by Microbial Means, Including Research Into Different Aspects of Toxicity and Biological Value of Such Products"

for 1974-1977

Coordinators: Dr. Gregorian (USSR)
Dr. Daniel I.C. Wang (USA)

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| Name of Topic and Divisions | Participants | | Duration of Task | Forms of Cooperation | Results of Work |
|---|---|---|------------------|-------------------------|--|
| | USSR | USA | | | |
| 1. Assortment and selection of microorganisms of active which protein producers by the amino acid content for food and feed | 2 | 3 | 4 1974-77 | 5 | 6 |
| Selection of bacterial yeast cultures | Inst. of Biochem. & Physiol. of Microorgan-isms; Moscow St. Univ.; Inst. of Protein Synthesis | North Regional Res. Labs. MIT U. of Wisc. | 1974-77 | Exchange of strains | Obtaining highly productive industrial strains |
| 2. Development of methods for comparative evaluation of strains among them | Inst. Bio-chem. & Phys. Res. Labs. of Microorgan-isms; Inst. of Protein Synthesis | North Region. 1975-78 | | Exchange of information | Devel. of methods for selecting strains by raising content of irreplaceable amino acids (1974-75) Development of methods of direct synthesis (1976-77) |

Study of possible ways for regulating direct biosynthesis of proteins in order to raise the content of essential amino acids (methionine, cysteine, tryptophan, lysine)

2. Techno-economical comparison of various kinds of raw materials for microbiological synthesis with econ. analysis

1975-76

2.1 Cultivation of yeast cultures on molasses, ethanol, methanol, hydrocarbon with forecasting of techno-econ. characteristics

Inst. of Protein Synthesis

MIT
U. Penn.

Exchange of information

Obtaining technical and economical characteristics of technological processes 1976

2.2 Cultivation of bacteria on methanol, ethanol, gaseous and liquid hydrocarbons of normal paraffin series, agricultural and industrial refuse, with determination of techno-econ. characteristics

Inst. of Biochem. & Phys. of Microorganisms
Inst. of Protein Synthesis

U. of Missouri

Exchange of information

Obtaining technical and economical characteristics of technological processes (1976)

2.3 Comparative evaluation of basic characteristics and choice of substrates

Inst. of Protein Synthesis

MIT

U. of Penn.
U. Missouri

1st stage
=1974-75 (see addendum 1)
2nd stage
=1976

1. Develop. of methods of comparative techno-econ. level-1974

2. Prognostic comparison of techno-econ. analysis for determining raw materials

1st stage-1974-75 (theor)
2nd stage-1976 (specific

Improving methods of separation of protein substances from biomass of a single cell organism

| 1 | 2 | 3 | 4 | 5 | 6 |
|--|---|-----------------|---------|-------------------------|--|
| Devel. of enzymatic & mechanical methods of protein release | Research Inst. of Element-organic Compound Inst. of Protein Synthesis | MIT | 1974-77 | Exchange of information | Establish technical, cal & economical feasibility for industrial use |
| Purification of microbe biomass from nucleic acids by enzymes-by physical-chemical means | Inst. of Protein Synthesis | MIT | 1974-76 | Exchange of information | Determination & selection of fermentors; devel. & testing of technological process -1975 |
| Devel. of industrial methods for obtaining protein from single-cell microorganisms | Inst. of Bio-tech. Inst. of Protein Synthesis | MIT | 1974-76 | Exchange of information | Establishment of technical & economical feasibility for industrial use |
| Apparatus for cultivation | (same as above) | MIT | 1974-76 | Exchange of information | Joint report on construction of industrial fermentors |
| Separation of biomass | Inst. of Protein Synthesis | U. of Minnesota | 1974-76 | Exchange of information | Same as 4.1 |
| Purifying and Drying | Same as above | | 1974-76 | Exchange of information | Same as 4.1 |
| Devel. of large-scale apparatus for purifying biomass, production, process & economic analysis | | | 1974-76 | Exchange of information | Same as 4.1 |

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| 1 | 2 | 3 | 4 | 5 | 6 |
|---|--|---------------------|---------|--|---|
| Specialized processing of biomass & separation of foods protein nutrients from it | Research Inst. of Element-organic Compounds Inst. of Protein Synthesis Acad. of Sci.-Nutrition Inst. | MIT U. of Minnesota | 1975-77 | Exchange of information | Devel. of technology |
| Biological value and harmlessness of single-cell proteins microorganisms | Inst. of Nutrition Academy of Med. Sciences, USSR | MIT | 1974-77 | Exchange of information Joint discussion of results of research | Devel. of unified methods for determining biological value and harmlessness |

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Plans for Joint Conference on Sending and Reception
of Scientists for Carrying Out Scientific Program
for Obtaining Substances from Microorganisms

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| Number | Activities | Place to be Carried Out | Date and Duration (Days, Months) | Organization Responsible for Carrying out Tasks, No. of Participants | USA | USSR | Working Programs |
|--------|--|-------------------------|----------------------------------|--|------|------|---|
| 1 | | | | | | | |
| 2 | Project No. 1: "Development of Technology for Industrial Production and Utilization of Food and Feed Proteins by Microbial Means, Including Research Into Different Aspects of Toxicity and Biological Value of Such Products" (1975-1977) | | 4 | | 5 | 6 | |
| 1 | Conference, Joint Discussion of Status of Research for Obtaining Protein Isolates and Development of Microorganism Strains. Visit Laboratories and Companies | USA | 1st Quarter 1975 (10 days) | | USSR | USA | MIT |
| | | | | | | | Research Institute of Element-organic Compounds, All Union Scientific Research Institute of Protein Synthesis (4 persons) |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|--------------------|---------------------------|---|----------------------------|------------------------|
| 2 | Joint Research of possible means for directing biosynthesis of proteins with view of increasing content of essential amino acids (methionine, cysteine, tryptophan, lysine) | USSR USA | 1975-1977 | USSR Institute of Biochemical Physiology of Microorganisms Academy of Science, MIT Moscow State Univ., Inst. of Protein Synthesis (3 people) | USA NRRL (3 persons) | Working Programs 1 & 2 |
| | Exchange of Scientists, one man per year per country | | | | | |
| | Conference "Comparative Evaluation and Selection of Substrates in course of cultivating microorganisms" | USSR Moscow | 4th Quarter 1975, 10 days | Institute of Protein Synthesis | U. of Pa. MIT | Same as above |
| | Visit Institutes of USSR | | | | U. of Missouri (4 persons) | |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|-------------|-----------------------------|--|---|---|
| 4 | Joint research for obtaining Technical and Economical Indicators on growth of yeast on molasses, ethanol, methanol and hydrocarbons. Exchange of Scientists, 1 man per year per country | USSR USA | 1975-1976 | Institute of Protein Synthesis (2' persons) | U. of Pa. Same as above MIT 2 persons | |
| 5 | Conference "Medical Biological Research of Single-cell Protein" Visit Laboratories and Companies | USA | 1st Quarter 1976 10 days | Foodstuffs Inst. AMN Inst. Prot. Synthesis 4 persons | MIT Same as above | |
| 6 | Joint research on the development of methods for separating protein from biomass of single cell microorganisms. Exchange of scientists, 1 person per year per country | USSR USA | 1975-1977 | Research Institute of Element-Organic Compounds, Institute of Protein Synthesis 3 persons | MIT 3 persons 3 persons | |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|-------------|---------------------------|--|--|-----------------|
| 7 | Conference "Methods of Industrial Production of Proteins of Single-cell Microorganisms" Visit Institutes | USSR | 4th Quarter 1974* 10 days | Inst. of Protein Synthesis, All Union Sci. Res. Biotechnology. 4 persons | U. of Pa. MIT U. of Missouri 4 persons | Project 4.1-4.4 |
| | Joint research on the development of industrial method and equipment for obtaining proteins of single cell microorganisms" Exchange of scientists 1 person per year per country | USSR USA | 1975-1976 | Inst. of Prot. Syn., All union Sci. Res. Biotech. 2 persons | MIT 2 persons | Project 4.1-4.4 |
| | Conference "Method of Processing biomass and extraction of food protein from it" Visit Labs. and Companies | USA | 1st Quarter 1977 10 days | Research Inst. of Element-organic Compounds, IPANN, 6 persons | MIT U. of organic Compounds, Minn. 6 persons | Project 5 |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|----|--|------|------------------------------|--|---|-----------|
| 10 | Joint research on the development of methods of obtaining food proteins from microorganisms biomass" | USSR | 1975-1977 up to 6 months | Res. Inst. of Element-Organic Compounds, IPAMN USSR 3 persons | MIT Univ. of Minn. 3 persons | Project 5 |
| 11 | Exchange of Scientists, 1 persons per year per country | | | | | |
| | Conference to sum up program results | USSR | Fourth quarter 1977, 10 days | Inst. of Protein Synthesis Inst. Biochem. & Phys. of Microorg. Inst. of Elemen. Organic Compounds Inst. of Nutrition Acad. of Med. Sci, USSR All Union Scient. Res. Inst. Biotech. | MIT, North. Region. Res. Lab. U. of Penn. U. of Miss. U of Minn. U of men | Project 5 |

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*Note: The date of the conference will be determined.

PROJECT 2

WORKING PROGRAM

ENGINEERING RESEARCH AND DEVELOPMENT OF EQUIPMENT FOR THE
COMPUTERIZED SIMULATION, DESIGN AND CONTROL OF PROCESSES
FOR MICROBIAL TECHNOLOGY

Dr. Arthur Humphrey,
Univ. of Penn.-USA
Dr. Charles Cooney,
Co-ordinator, MIT
Dr. S. Yenikejev, Inst.
of Chem., Tech., Kazan
Coordinators: Dr. N. Postnikov, Co-
ordinator, Inst. Bio.
Engr., Moscow

| No. | Name of topic and divisions | Participants | Duration of Task | Forms of Cooperation | Expected Results |
|-----|---|---|--|---|---|
| 1 | 2 | 3 | 5 | 6 | 7 |
| I. | Development of methods and new sensors for measuring the significant variables in microbial processes and assembling equipment for experimental investigations | USSR | USA | | |
| I.1 | Joint working conference for evolving recom- mentations on research directions in area of sensor development | Kazan Inst. of Chemical Tech. (KICT) Inst. of Bioeng. | U. of Penn. one week 1st or 2nd Quarter | Conference at U. of Penn. 5 participants ea/ from USSR & USA | Devel. of general report with recom- mendations for research directions in areas of process new sensors. |
| 1.2 | Development of Instrumentation relative to measure- ment of biomass (including computer interface and software) | KICT Inst. of Bioeng. | U. of Penn. 2 yrs. 1975-77 | exchange of scientific reports; ex- change of one collaborator from each country (12 months ea.) | Development of tech- nical documentation and equipment |

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----|---|--|--|--------------------------|--------------------------------|---|--|
| 1.3 | | Development of instrumentation relative to measurement of microbial culture characteristics (including interface & software) | KICT Inst. of Bioeng. | U. of Penn. | 3 years 1975-1978 | same as 1.2 | same as 1.2 |
| 1.4 | | Development of instrumentation relative to measurement of environmental characteristics (including interface & software) | KICT Inst. of Bioeng. | U. of Penn. | same as 1.3 | same as 1.2 | same as 1.2 |
| 2. | | Investigation of mass, momentum and heat transfer in heterogeneous gas-liquid-liquid type of cultural condition, as well as kinetics and biochemical mechanisms of hydrocarbon uptake by microorganisms. | | | | | |
| 2.1 | | Conference on mechanism of hydrocarbon uptake by microorganism and hydrodynamic theory of culture media | KICT Inst. of Protein synthesis Inst. of Bioeng. | Kansas State Univ. (KSU) | 1 week--1975 2nd & 3rd Quarter | Conference at Inst. of Protein Synthesis Moscow; 5 participants from each country | Devel. of general report on status of research in this area and recommendations on directions of future research |

| | | | | | | |
|-----|---|---|------------------------|-----------------|--|--|
| 2.2 | Devel. of experimental apparatus & research on kinetic and biochem. mechanisms of hydrocarbon uptake by microorganisms | Inst. of Protein Synthesis KICT | U. of Penn. M.I.T. KSU | 2 years 1975-77 | Exchange of scientific reports; exchange of one collaborator from each country (12 man-months equivalent) | Obtaining experimental information for development of mathematical models for simulation of biochemical kinetics of hydrocarbon uptake |
| 2.3 | Devel. of hydrodynamic theory of heterogeneous microbial systems of the gas-liquid-liquid type | KICT | KSU | 2 years 1975-77 | exchange of sci. reports; exchange of 1 scientific collaborator from each country (12 man-months equivalent) | Devel. of mathematical models for simulation of the heterogeneous cultural environment |
| 2.4 | Devel. of experimental apparatus and obtaining data enabling formulation of hydrodynamic model for simulation of heterogeneous fermentation systems of the gas-liquid-liquid type | KICT Inst. of Biotech. Inst. of Protein Synthesis | KSU U. of Penn. MIT | 2 years 1975-77 | exchange of sci. reports; exchange of one scientific collaborator from each country (12 man-months equivalent) | Experimental data necessary for mathematical simulation of cultural environment |

1 2 3 4 5 6 7

3 Research on population dynamics of microorganisms

| | | | | | | |
|-----|--|--|---------------------------|-------------------------------|--|---|
| 3.1 | Conference to specify directions of theoretical and experimental work | KICT Inst. of Bio'eng. | KSU MIT U. of Penn. | 1 week 1975 3rd quarter | Conference at KSU 5 participants ea. from USSR and USA | Report summarizing problems |
| 3.2 | Devel. of structural theory and population dynamics in continuous fermentation | KICT | KSU MIT | 2 years 1975-77 | exchange of sci. reports; exchange of 1 scientific collaborator from each country (12 man-months) | Devel. of math. models for simulation of population dynamics of microorganisms |
| 3.3 | Assembly of experimental apparatus & collection of data to formulate models of microbial population dynamics | KICT Inst. of Bioeng. Inst. of Protein Synthesis | U. of Penn KSU | 2 years 1975-77 | Exchange of sci. reports; exchange of 1 scientific collaborator from each country (12 man-month equivalent) | Experimental data for math. simulation of population dynamics of microorganisms |

Development of Engineering Techniques for Optimal Design of Industrial Scale Fermentors and Automatic Control of Industrial Fermentation Processes:

4.1

Conference on summarized results of topics 1,2,3 according to these aspects:
 1. theory & math. model of processes of hydrocarbon fermentation processes
 2. Characteristics of computer controlled fermentation system

KICT
 Inst. of Bio eng.
 Inst. of Protein Synthesis

U. of Penn.
 MIT
 KSU
 New Brunswick Scientific (NSB)

1 month 1977
 2nd or 3rd quarter

Conference at Inst. of Protein Synthesis; 10 participants from each country

Summary report on research result of topics 1,2,3;
 Proposal to design a demonstration computer controlled fermentation system.

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4.2

Development and testing of math. model for hydrocarbon fermentation processes.

KICT
 Inst. of Bioeng.

U. of Penn.
 MIT
 KSU

1 year
 1977-78

exchange of research results
 exchange of one sci. collaborator from each country (12 months)

Development of math. model for optimal design and automatic control of hydrocarbon fermentation processes.

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4.3

| | | | | | |
|---|--|---------------------------------|-------------------|---|---|
| Devel. of Engineering techniques for optimal design of industrial scale fermentor | KICT Inst. of Bioeng. Inst. of Protein Synthesis | U. of Penn KSU MIT NBS | 1 year 1978-79 | Exchange of research results exchange of one sci. collaborator from each country (12 man-months equivalent) | Devel. of optimal industrial scale fermentor for production of single-cell proteins from hydrocarbons |
|---|--|---------------------------------|-------------------|---|---|

4.4

| | | | | | |
|---|--------------------------|---------------------------------|-------------------|---|---|
| Devel. of automatic computer control techniques for industrial scale fermentation processes | KICT Inst. of Bioeng. | U. of Penn MIT KSU NBS | 1 year 1978-79 | Exchange of research results exchange of one sci. collaborator from each country (12 man-months equivalent) | Software specification for computer control of fermentation processes |
|---|--------------------------|---------------------------------|-------------------|---|---|

5.

| | | | | | |
|--|--|--|--|--|--|
| Design, construction and demonstration of a fermentation process computer control system for producing Single-Cell Protein from Hydrocarbons | | | | | |
|--|--|--|--|--|--|

5.1

| | | | | | |
|---------------------------------------|--|----------------------------------|---------------------------------------|--|--|
| Conference to coordinate project work | KICT Inst. of Bioeng. Inst. of Protein Synthesis | U. of Penn. MIT KSU NBS | 2 weeks 1978 2nd or 3rd quarter | Conference at New Brunswick Scientific | Finalization of design proposal including specification of equipment |
|---------------------------------------|--|----------------------------------|---------------------------------------|--|--|

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----|---|--|---|-----------------------------------|---|---|---|
| 5.2 | Design, production and installation of computer controlled Fermentor | KICT Inst. of Bioeng. Inst. of Protein Synthesis | New Brunswick Scientific MIT U. of Penn. KSU | 2 years 1978-80 | Exchange of visits for consultations on design and construction of apparatus 8 one week consulting visit | Optimally designed fermentor with computer control | |
| 5.3 | Demonstration in USSR of computer controlled process for producing single-cell protein | KICT Inst. of Bioeng. Inst. of Protein Synthesis | New Brunswick Scientific U. of Penn. MIT KSU | 3 months Summer, 1980 | Summary conference with the ten leading developers from each side | Optimal process producing single-cell protein from hydrocarbons | |
| 6. | Joint Writing and Publishing of Book on Computer Simulation, Design and Control of Fermentation Systems | | | | | | |
| 6.1 | Meeting to discuss plans and outline joint book | Yenikeyev KICT | Humphrey U. of Penn. | 1975, during meeting on topic 1.1 | Agreement on outline and participants | Book outline and contents plus writing assignments | |

| | | | | | |
|-----|--------------------------------------|-------------------|--------------------|--|------------------------------|
| 6.2 | Writing of ; separate chapters | authors | 3 years 1975-78 | Exchange of chapters and critical analysis | Manuscript of book |
| 6.3 | Editing and publishing of book | Yenikeyev KICT | 1 year 1978-79 | Editing book in Russian and English | Joint publication of book |

WORKING PROGRAM

of cooperation on the project, No. 3 "Molecular biology of industrial microorganisms"

Coordinators: S.I. Alifkhanian (USSR), H. Halvorson and W. Brown (USA)

| nts | Main topics and steps of their development | Participants | Dates | Forms of cooperation: | Expected results |
|-----|--|---|----------------|---|--|
| | | USSR | | USA | |
| 1 | 2 | 3 | 4 | 5 | 6 |
| 1 | Development of genetic methods for improving industrial microorganisms based on approaches of molecular genetics using microorganisms producing enzymes antibiotics and other substances | | 1975-78 | | |
| | 1.1. Conference on new methods of selection of industrial microorganisms | Inst. Genetics of Microorganisms | 1975 5 days | Conference in USA 10 persons (USSR) | Exchange of information and design of re-search projects |
| | 1.2. Conference on genetic engineering | Inst. of Genetics of Microorganisms Inst. Biochem. and Physiology of Microorganisms organisms, USSR Acad. of Sciences | 1976 4 days | 10 persons (USA) Conference in USA 5 persons (USSR) | Exchange of information and design of re-search projects |
| | 1.3. Using the methods of genetic engineering and molecular biology for development of strains of industrial microorganisms | (Inst. Genetics of Microorganisms, Inst. Biochem. and Physiology of Microorganisms USSR Acad. of Sciences) | 1976-78 | Exchange of information and strains | Development of new methods of selection of micro-organisms |
| | | Brandeis U. Stanford U. | | | Joint Research projects |

1 2 3 4 5 6

1.4. Joint development of methods for increasing the activity of enzyme producers, - on the model of microorganisms decomposing cellulose

Inst. genetics of micro-organisms

Natick Lab., Mass.

1975-1977

1976 - 1 person up to 6 months

1977 - 2 persons for up to 6 months

Exchange of information and strains. Holding joint workshop:

1) Workshop in

USSR, 1976

5 days,

5 persons

(USA);

2) Workshop in

USA, 1977, 5

days, 5 persons

(USSR)

Scientist exchange:

1976 - 1 person up to 6 months

1977 - 1 person up to 6 months

Increase productivity of cellulase producers

1 2 3 4 5 6

2. Development of methods of genetic analysis of microorganisms used for control of injurious insects

1975-78

2.1 Symposium Genetics and physiology of entomopathogenic microorganisms*

Inst. Genetics of Microorganisms

Northern Lab., Peoria, Michigan U., Wisconsin U.

Workshop in USSR, 5 days; USA (5 persons)

Exchange of information, development of research program

2.2 Joint genetic research of toxin production, sporulation and virus production in bacilli

Inst. Genetics of Microorganisms

Northern Regional Lab., Peoria Brandeis U.

1976-1978 Workshop in USA, 5 days; USSR (5 persons)

Increasing productivity of strains in toxin production

2) Workshop in USSR; 1977, 5 days; USA (5 persons)

Exchange of scientists: 1976 - 2 persons up to 6 months

1977 - 2 persons up to 6 months

Development of methods of genetic analysis of bacilli viruses

*To be held in conjunction with 3.1.

1

2

3

4

5

6

3. Development of genetic methods to improve industrial strains of microorganisms, including utilization of hydrocarbons, methanol and other raw material resources

3.1. Conference on mutagenesis

Leningrad Univ.

Univ. of Calif. Berkeley

1975

Conference in USSR - 5 days USA (5 persons)

Exchange of information

1975-1978

3.2. Study of genetic systems of controlling different substrates assimilation by yeasts

Inst. Genetics of microorganisms Leningrad Univ.

Univ. of Calif. Berkeley

1975-1978

U. of Washington, Seattle NSF grantees

Exchange of information and strains, performing joint research projects, and holding joint workshops
1) Workshop in USA, 1976, 5 days; 5 persons (USSR)

1 2 3 4 5 6

2) Workshop in USSR, 1977, 5 days; 5 persons (USA)

Exchange of scientists:

1975-77 1 person up to 6 months a year (3 persons in all)

Improvements of methods of genetic analysis in fungi

Leningrad Univ. Inst Genetics of Microorganisms

Univ. Calif., Berkeley
U. of Washington, Seattle
NSF grantees

1975-78

Exchange of information and strains, performing joint research projects, and holding joint workshops

1) Workshop in USA, 1977, 5 days, 5 persons (USSR)

Exchange of scientists: 1 person up to 6 months a year (2 persons in all)

Development of improved methods of selection of industrial strains

- 6 -

| 1 | 2 | 3 | 4 | 5 | 6 |
|----|---|----------------------------------|---|---|--|
| 4. | Development of methods of genetic analysis of microorganisms - producers of amino acids and different metabolites | Inst. Genetics of Microorganisms | U. of Rochester U. of Chicago MIT NSF grantees | 1975- Exchange of information and strains, performing joint research projects, and holding joint workshops 1) Workshop in USSR, 1976, 5 days, USA (5 persons) Scientist exchange: 1976 1 person up to 6 months 1977 1 person up to 6 months | Development of new methods genetic alteration of strains producing different metabolites |
| 4. | Joint development of genetic methods of developing strains - producers of amino acids | Inst. Genetics of Microorganisms | Brandeis U. | 1979 Conference in USA or USSR | Publication of a book on conference results |
| 4. | Holding a conference on results of fulfillment of the cooperative program | Inst Genetics of Microorganisms | | | |

Molecular Biology

Summary of Conferences

| <u>Year</u> | <u>Subject</u> | <u>Host</u> | <u>Number of Visitors</u> | |
|-------------|----------------|------------------------------|---------------------------|-------------|
| | | | <u>US</u> | <u>USSR</u> |
| 1975 | 1.1 general | USA | | 10 |
| | 2.1 | USSR | 5 | |
| | 3.1 | USSR | 5 | |
| 1976 | 1.2 | International meeting in USA | 5 | 5 |
| | 1.4 | USSR | 5 | |
| | 2.2 | USA | | 5 |
| | 3.2 | USA | | 5 |
| | 4.1 | USSR | 5 | |
| 1977 | 1.4 | USA | | 5 |
| | 2.3 | USSR | 5 | |
| | 3.2 | USSR | 5 | |
| | 3.3 | USA | | 5 |

Summary of Exchange of Scientists

| <u>Points of the Various Programs</u> | <u>1975</u> | <u>1976</u> | <u>1977</u> |
|---------------------------------------|-------------|-------------|-------------|
| 1.3 | -- | 1 (6 mos) | 2 (6 mos.) |
| 1.4 | -- | 1 (6 mos.) | 1 (6 mos.) |
| 2.2 | -- | 2 (6 mos.) | 2 (6 mos.) |
| 3.2 | 1 (6 mos.) | 1 (6 mos.) | 1 (6 mos.) |
| 3.3 | -- | 1 (6 mos.) | 1 (6 mos.) |
| 4.1 | -- | 1 (6 mos.) | 1 (6 mos.) |
| Totals | 1 | 7 | 8 |

WORKING PROGRAM

Project 4: "Development of Ways to Produce and Apply Enzymes
for Industrial and Analytical Goals"

for 1974-80

Coordinators: I. Berezin, K. Kalunyanit
(USSR),
G. T. Tsao (USA)

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| 1 | 2 | 3 | 4 | 5 | 6 |
|--|---|------------------------------------|--------------|--|---|
| Research and isolation of productive strains of microorganisms producing enzyme systems, including systems categorized by hydrolysis of glycoside bonds, oxidation of hydrocarbons; study of conditions instrumental to biosynthesis of maximally possible quantities of enzymes | Inst. of Biotech., Moscow St. Univ. | NSF Grantees | 1974-80 | Joint research program; exchange of strains and information; dev. of united ways of testing; joint symposia within the program | Finding of high productive strains of microorganisms & development of technology of their cultivation |
| 1.1 | Selections of enzyme producing microorganisms | Inst. of Biotech. Moscow St. Univ. | NSF Grantees | 1974-80 | Exchange of strains & their analysis |
| 2 | Study of microbial physiology, assortment of culture mediums; devel. of optimal conditions for their cultivation, guaranteeing improvement in biosynthetic activity | Inst. of Biotech. Moscow St. Univ. | NSF Grantees | 1974-80 | Joint research program; exchange of information; joint symposia within program |
| | Development of methods for large-scale preparation, separation, and purification of necessary enzymes, including systems categorized by hydrolysis of glycoside bonds and oxidation of hydrocarbons | Inst. of Biotech. Moscow St. Univ. | NSF Grantees | 1974-80 | Joint research program; exchange of information & documentation; joint consultations within program |

1

2

3

4

5

6

| | | | | | |
|-----|--|--|---------|---|--|
| 2.1 | Determination of optimal conditions for separation of enzymes | Inst. of Bio- NSF Grantees tech., Moscow St. Univ. | 1974-80 | Same as 2 | Finding optimal conditions for separating enzymes |
| 2.2 | Development of technical process for separation of enzymes | Same as above | 1974-80 | Same as 2 | Devel. of technology for separating enzymes |
| 2.3 | Development of technical process for purification of enzymes | Same as above | 1974-80 | Same as 2 | Devel. of technology for purifying enzymes |
| 2.4 | Development of methods for stabilization of enzymes | Inst. of Biotech. | 1974-80 | Same as 2 | Recommendations ways for stabilizing enzymes |
| 2.5 | Design of industrial equipment | Inst. of Biotech. | 1974-80 | Same as 2 | Devel. of industrial equipment for separating and purifying enzymes |
| 2.6 | Development of methods for obtaining technological production of immobilized and stabilized enzymes; research on properties of immobilized enzymes | Inst. of Biotech Moscow St. Univ.; TPI; Acad. of Sci, USSR | 1974-80 | Joint research program; exchange of information & preparations; joint execution of research & consultations, symposia | Devel. of new ways of enzyme immobilization and industrial processes of their production; creation of theoretical basis of activity of immobilized enzymes |
| 2.7 | Choice of carriers & methods for enzymes immobilization | Inst. of Biotech; Moscow St. U.; TPI, Acad. of Sci. USSR | 1974-80 | Same as 3 | Choice of optimal carriers & methods of immobilization |

| 1 | 2 | 3 | 4 | 5 | 6 |
|--|--|---------------|---------|---|---|
| 3.2 Development of methods for immobilization of multienzymes and/or cofactor systems | Inst. of Biotech; Moscow St. U.; TPI; Acad. of Sci., USSR | NSF Grantees | 1974-80 | Same as 3 | Devel. methods of immobilization of multi enzymes and/or cofactor systems |
| 3.3 Development of theoretical & experimental processes catalyzed by immobilized enzymes | Inst. of Biotech; Moscow St. U.; TPI; Acad. of Sci. USSR | Same as above | 1974-80 | Same as 3 | Creation of theoretical & experimental processes catalyzed by immobilized enzymes |
| 3.4 Development of technological processes & equipment for production of immobilized enzymes | Inst. of Biotech; TPI | Same as above | 1974-80 | Same as 3 | Creation of technological & apparatus for producing immobilized enzymes |
| 3.5 Stabilization of soluble enzymes | Moscow St. U. | Same as above | 1974-80 | Same as 3 | Obtain stable enzymes for treatment of insoluble substrates |
| 4. Diagnostic & Analytical Uses of enzymes; including immobilized enzymes | Moscow St. U. | Same as above | 1974-80 | Joint research program; exchange of information. Joint consultations within program | Devel. new diagnostic & analytical methods |
| 4.1 Enzyme-immuno analysis | Moscow St. U. | Same as above | 1974-80 | Same as above | Creation of methods for enzyme-immunity analysis |
| 4.2 Development of enzyme methods for detecting faint light or sound | Moscow St. U. | U. of Penn. | 1974-80 | Same as above | Creation of light & sound sensitive materials |

| 1 | 2 | 3 | 4 | 5 | 6 |
|--|---|----------------------|---------|--|--|
| 1.3 Development of enzyme electrodes & methods for analytical applications | Moscow St. U. | NSF Grantees | 1974-80 | Same as 4 | Creation of enzyme electrodes & analytical methods of their use |
| Creation of scientific bases; devel. of tech. processes & equipment for enzymatic transformation of substances | Inst. of Biotech. Same as above Moscow St. U. | | 1974-80 | Joint re-search program & exchange of information, documentation & preparations; joint consultations & symposia within the program | Devel. of new tech. processes & equipment for obtaining enzymes; their use in information, agriculture |
| 1. Production of sugar from cellulose | Same as above | U. of Calif-Berkeley | 1974-80 | Same as above | Creation of enzyme catalysts; devel. of tech. & equipment for obtaining sugar from cellulose |
| 2. Production of fermentable sugars from starch & agricultural wastes | Inst. of Biotech. NSF Grantees | | 1974-80 | Same as above | Creation of enzyme catalysts; devel. of tech. & equipment |
| 3. Enzyme production of milk substitutes | Same as above | Same as above | 1974-80 | Same as above | Creation of enzyme catalysts; devel. of tech. & equipment |
| 4. Production of amino acids by enzymatic cleavage of protein waste products | Inst. of Biotech. Same as above Moscow St. U., Acad. of Sci., USSR | | 1974-80 | Same as above | Creation of enzyme catalysts; devel. of tech. & equipment |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-------|--|----------------------------------|------------------------------|--------------|-------------------------|--|
| 5.5 | Obtaining oxygen-containing products by enzyme oxidation of hydrocarbons | Inst. of Biotech.; Moscow St. U. | NSF Grantees | 1974-80 | Same as 5 | Creation of enzymic catalysts; scientific basis for technology |
| 5.6 | Establishment of joint workshops, symposia, and working conferences | Scientists from USSR and USA | Scientists from USA and USSR | 1974-80 | Same as 5 | Discussion and evaluation of results & plans |
| 5.6.1 | Working conference on Project 4 | same as above | Same as above | Sept. 1974 | Working Conference | Discussion of pre-research on Project 4 |
| 5.6.2 | Workshops in USA on Points # 1 and 5.2 | 7 people | 7 people | 1975 10 days | Exchange of information | Evaluation of results & discussion of plans |
| | Points # 3.2 & 4 | 7 people | 7 people | 1977 10 days | Same as above | Same as above |
| | Points # 2.5, 3, 4, 5 | 7 people | 7 people | 1979 10 days | Same as above | Same as above |
| 5.6.3 | Workshops in USSR on Points # 2 & 5.2 | 7 people | 7 people | 1976 10 days | Exchange of information | Evaluation of results & discussion of plans |
| | Points # 5.1, 5.3, 5.5 | 7 people | 7 people | 1978 10 days | Same as above | Same as above |
| | Concluding workshop on Project 4 | 7 people | 7 people | 1980 10 days | Same as above | Same as above |

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| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|-----|---|-----------------------------|-----------------------------|------------------|-------------------------|---------------------------------|
| 6.4 | Exchange of Scientists for research on the program | 2 people | 2 people | 1975 6 months | Joint research | Obtaining of scientific results |
| | | 2 people | 2 people | 1976 6 months | Same | Same |
| | | 4 people | 4 people | 1977 6 months | Same | Same |
| | | 4 people | 4 people | 1978 6 months | Same | Same |
| | | 4 people | 4 people | 1979 6 months | Same | Same |
| | | 4 people | 4 people | 1980 6 months | Same | Same |
| 6.5 | participation in 6 international & national conferences workshops in US and USSR on program project | 4 people to each conference | 4 people to each conference | 1975-80 | Exchange of information | Exchange of information |

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By agreement of the cochairmen, the topics and agenda on point 6 can be changed.

WORKING PROGRAM

Project 5

MICROBIOLOGICAL CONTROL OF PESTS IN AGRICULTURE

Coordinators: O. Alioshina (USSR) and A. Heimpel (USA)

| No. | Name of Topic and divisions | Participants USSR | USA | Duration of Task | Forms of 'Cooperation' | Expected Results |
|-----|--|---|--|--|---|--|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| I | Sporulation of Milky Disease Bacteria | | | 1975-78 | | |
| 1 | Exchange of publications and bacterial cultures | Nat'l Acad. of Sc., Inst. of Microbiology Armenia, SSR | Cornell Experi- mental Station; Agricul- tural Sta- tion, Belts- ville, Md. | 1975 | Exchange of information of val- uable strains for further wo | Establishment of val- uable strains for further wo |
| 2 | Development of research plans and visit to laboratories | same as above | same as above | 1975 (3 days working mtg, 7 days visit) | Mtg in USA; Exchange 6 partici- pants from ea. country | Exchange o informatio |
| 3 | Isolation of diseased insects, bacteria, and research on bacterial sporulation | same as above | same as above | 1975-78 | Cooperative research and exchange info. bac- | To obtain spolulat |
| 4 | Discussion of results obtained | same as above | same as above | 1976 (3 days, 7 days visit) | Mtg in USSR 6 US 6 USSR | Plan futu program |
| 1.5 | Development and preparation of final report | same as above | same as above | Spring 1978 (5 days) | Mtg in US 6 US 6 USSR | Prepare Final rep |

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PROJECT 5

WORKING PROGRAM

ENGINEERING RESEARCH AND DEVELOPMENT OF EQUIPMENT FOR THE COMPUTERIZED SIMULATION, DESIGN AND CONTROL OF PROCESSES FOR MICROBIAL TECHNOLOGY

Coordinators: O. Alioshina (USSR) and
A. Heimpel (USA)

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| No. | Name of topic and divisions | Participants | Duration of task | Forms of Cooperation | Expected Results |
|-----|---|---|------------------------|--|---|
| 1 | 2 | USSR 3 USA 4 | 5 | 6 | 7 |
| 2.0 | Production of viruses | | | | |
| 2.1 | Exchange of cell lines and publications. Visit laboratories | Inst. of Mole- cular Genetics Univ.; Agri- Inst. of Bacterial Prepa- rations | 1975 10 days | Meeting in USSR; -6 participants from each country (including visit to laboratories) | Exchange of information |
| 2.3 | Research on problems and visit to labora- tories | same as above | 1975-76 10 days | Joint meeting in USA in 1976, (6 partici- pants from each country) serving viruses | Development of methods for obtaining & use |
| 2.4 | Report summary | | 1977 | 5 days Meeting in US 10 persons from each country-discussion of report | Recommendation for report summary |
| 2.0 | Development of a single standardi- ation System and valuation of bacterial and Viru- lent Qualities of Entomopathogenic Preparations | Inst. of Bacterial Preparations Inst. of Microbiology Nat'l. Acad. of Sciences, Armenia, | | | |
| 1 | Research program | Participating institutions will be submitted later (5 days) | 1975-78 | Symposium on methods of standardization 1976, 10 participants from USSR & 10 from USA | Discussion on Standard ization of methods; selection of optimal |

PROJECT 5

WORKING PROGRAM

ENGINEERING RESEARCH AND DEVELOPMENT OF EQUIPMENT FOR THE
COMPUTERIZED SIMULATION, DESIGN AND CONTROL OF PROCESSES
FOR MICROBIAL TECHNOLOGY

Coordinators: O. Alioshina (USSR) and
A. Heimpele (USA)

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| No. | Name of topic and divisions | Participants USSR | USA | Duration of task | Forms of Cooperation | Expected Results |
|-----|---|---|----------------------------|------------------|---|--|
| 1 | | 3 | 4 | 5 | 6 | 7 |
| 3.2 | Execution of research | Inst. of Bacteriological Preparations will be submitted later | Participating institutions | 1975-78 | Exchange of information as a result of research | Joint publication of research results recommendations of standardized methods analysis |
| 3.3 | Point verification of recommended methods | Same | Same | 1978 (5 days) | Meeting in USSR to execute joint verification of recommended methods (6 people from each country) | Instruction on the use of standardized method |

Exchange of junior-level research personnel. Junior-level research personnel actively engaged in one of the research tasks officially accepted by the Joint Working Group will visit laboratories in the other country for the purpose of doing joint research, demonstrating methods, learning special techniques and comparing results. The length of visits of such research personnel may be for periods of up to ten months. The principle of receiving side pays will apply here. Personnel will be selected by the sending side country with the concurrence of the receiving side.

Exchange of Senior Research Personnel. Task leaders and senior scientists on projects covered by the agreement will be accepted in one or more laboratories for appropriate periods. Such visits will be on a receiving side pays basis. The visits will consist of either joint research visits and planning, lectures, conferences, or combinations of these. In addition, senior research personnel with extensive knowledge in the official research areas may visit the other country on the same basis as the principal investigators. Such individuals will be considered when they have special expertise and where their advice to either the sending or the receiving side (or both) would be beneficial to the program.

Conferences. Conferences will be held from time to time on various approved research topics. The location of the conferences in each project area will alternate, insofar as possible, between the two countries. The principle of receiving side pays will apply here. Individuals to attend will be chosen by the sending country with the concurrence of the host country. The number of participants will approximate that specified by the research working plan.

Annual research reports. Each project coordinator will be responsible for submitting to his counterpart project coordinator in the month of July, through the Working Group Co-chairmen, annual summary reports of research, completed and in progress, including references to personnel and laboratories involved. These reports will contain sufficient details to allow publication of the research results. The publication of this research information will be made in accordance with the guidelines established by the US/USSR Joint Commission. If available, information in addition to that referred to in the reports and involving research done under the joint agreement, will be made available to either side upon request through the Working Group Co-chairmen.

Joint Meetings of Project Coordinators

Each project coordinator(s) and his counterpart(s) will maintain communication with each other and will meet for discussion concerning results of the various tasks, planning of further research and holding of conferences. They will also evaluate the effectiveness of the exchange of information and make recommendations to their respective chairmen for any necessary changes, both in the information exchange and in the research tasks being studied. Visits to laboratories of each side will be suggested and arranged for by the project coordinators with approval of the respective working group chairman. Meetings will be held alternately in each country on at least an annual basis.

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Agenda

for the 4th Meeting of the US/USSR
Joint Working Group

(June 1975, Moscow, USSR)

1. Reports of the coordinators on present state and results of the research projects.
2. Discussion of recommendations from both sides and arriving at decisions on possible broadening of the topics for cooperation.
3. Determination of agenda for the 5th Meeting of the Joint Working Group.
4. Miscellaneous